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SOUTH AFRICAN NATIONAL STANDARD

Pressure sensing devices for gas burners and gas burning appliances

This national standard is the identical implementation of EN 1854:2006, and is adopted with the permission of CEN, Avenue Marnix 17, B-1000 Brussels.

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Table of changes

Change No.	Date	Scope

National foreword

This South African standard was approved by National Committee SABS/TC 1019, *Gas supply, handling and control (fuel, industrial and medical gases)*, in accordance with procedures of the SABS Standards Division, in compliance with annex 3 of the WTO/TBT agreement.

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Compliance with a South African National Standard cannot confer immunity from legal obligations.

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This document will be reviewed every five years and be reaffirmed, amended, revised or withdrawn.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

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English Version

Pressure sensing devices for gas burners and gas burning appliances

Dispositifs de surveillance de pression pour brûleurs à gaz et appareils à gaz

Druckwächter für Gasbrenner und Gasgeräte

This European Standard was approved by CEN on 27 February 2006.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard (EN 1854:2006) has been prepared by Technical Committee CEN/TC 58 “Safety and control devices for gas burners and gas burning appliances”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2006, and conflicting national standards shall be withdrawn at the latest by October 2006.

This European Standard supersedes EN 1854:1997.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this European Standard.

The following changes from the superseded version have been included:

— operating pressure was increased from 4 bar to 5 bar;

— editorial changes due to the application of EN 13611: General requirements;

— technical changes due to the updating of the normative references, in particular the requirement for elastomers in contact with gas to conform to EN 549.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

This European Standard is a particular standard for specific controls for gas burners and gas burning appliances which cites EN 13611 "Safety and control devices for gas burners and gas-burning appliances – General requirements" wherever possible. This European Standard supplements or modifies the corresponding clauses of EN 13611. The construction and performance requirements are as far as applicable in total conformity with EN 13611.

1 Scope

This European Standard specifies requirements and test methods for pressure sensing devices (PSDs) for the control of pressures of combustible gases of the first, second and third families, air, combustion products and mixtures thereof for operating pressures up to 5 bar. It covers all types of PSD including electronic, differential and inferential types.

The requirements for 'S' class PSD are intended to meet the need for increased reliability for steam boilers. The methods of test given in this European Standard are intended for product type testing. Tests intended for production testing are not specifically included.

This European Standard covers type testing only.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 298:2003, *Automatic gas burner control systems for gas burners and gas burning appliances with or without fans*

EN 549, *Rubber materials for seals and diaphragms for gas appliances and gas equipment*

EN 13611:2000, *Safety and control devices for gas burners and gas-burning appliances — General requirements*

ENV 14459, *Method of risk analysis and recommendations for the use of electronics in systems for the control of gas burners and gas burning appliances*

EN 60529:1991, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*

EN 60730-1:2000, *Automatic electrical controls for household and similar use — Part 1: General requirements (IEC 60730-1:1999, modified)*

EN 60730-2-6:1995, *Automatic electrical controls for household and similar use — Part 2-6: Particular requirements for automatic electrical pressure sensing controls including mechanical requirements (IEC 60730-2-6:1991, modified)*

EN 61058-1, *Switches for appliances — Part 1: General requirements (IEC 61058-1:2000 + A1:2001, modified)*

EN ISO 75 (all parts), *Plastics — Determination of temperature of deflection under load*

ISO 4400, *Fluid power systems and components — Three-pin electrical plug connectors with earth contact — Characteristics and requirements*

ISO 6952, *Fluid power systems and components — Two-pin electrical plug connectors with earth contact — Characteristics and requirements*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 13611:2000 and the following apply.

3.1
pressure sensing device (PSD)
device which senses pressure and provides a signal

3.2
maximum working pressure (p_{max})
maximum pressure, positive or negative, the PSD can sustain without damage as declared by the manufacturer

3.3
operating pressure
pressure at which the PSD operates or switches

3.4
highest set point
highest declared pressure to which the PSD can be adjusted

3.5
lowest set point
lowest declared pressure to which the PSD can be adjusted

3.6
operating pressure range (set point range)
range of adjustment of the PSD between the highest and lowest set points

3.7
upper operating pressure
pressure at which the PSD operates or switches during an increase in pressure

3.8
lower operating pressure
pressure at which the PSD operates or switches during a decrease in pressure

3.9
operating differential
difference between the upper and lower operating pressures

3.10
deviation
difference between the declared or indicated operating pressure and the actual pressure measured before the endurance test expressed as a percentage of the declared or indicated operating pressure

3.11
drift
difference between the measured values of the operating pressure before and after the endurance test expressed as a percentage of the operating pressure before the endurance test

4 Classification

The PSD shall conform to one of two classes:

— standard class;

— class S

Class S PSDs shall have a higher level of performance and mechanical stability as specified in 6.1.12 and 7.4.6.

NOTE Class of electrical protection and similar are covered by Clause 8 of EN 13611:2000.

5 Units of measurement and test conditions

5.1 Units of measurement

Units of measurement shall be as given in EN 13611:2000, 5.1, 5.2 and 5.3, with the exception that there are no bending moment requirements applicable to PSDs.

5.2 Test conditions

Test conditions shall be in accordance with EN 13611:2000, 5.4.

All measured values shall be corrected to the standard conditions:

15 ºC, 1 013 mbar, dry.

6 Construction

6.1 General

6.1.1 Design, manufacture and assembly

The PSD shall be designed, manufactured and assembled in accordance with EN 13611:2000, 6.1 and 6.2.1.

6.1.2 Appearance

In terms of appearance, the PSD shall conform to EN 13611:2000, 6.2.1.

6.1.3 Access to internal parts

The PSD shall be designed such that access to internal parts requires the use of tools.

6.1.4 Dismantling and reassembly

Parts that require dismantling (e.g. for servicing) shall conform to EN 13611:2000, 6.2.9.

6.1.5 Moving parts

The function of moving parts (e.g. diaphragms, bellows) shall conform to EN 13611:2000, 6.2.7.

6.1.6 Sealing caps

Sealing caps of adjusters, if used, shall conform to EN 13611:2000, 6.2.8.

6.1.7 Breather holes

Breather holes shall conform to EN 13611:2000, 6.2.3.

6.1.8 Internal diameter of apertures of pressure transmission compartments

Apertures of all compartments used for pressure transmission shall have a minimum internal diameter of 0,7 mm, except in cases where a smaller aperture is protected against fouling and clogging by suitable measures, e.g. external filters (see 8.2).

6.1.9 PSDs with manual reset

PSDs with manual reset shall function by an action that is independent of manipulation or position of the reset member. Reset shall be manual.

NOTE Manual reset may require the use of a tool.

6.1.10 PSDs for combustible gas

6.1.10.1 General

PSDs for combustible gas shall, in addition to the requirements for PSDs for air, combustion products and mixtures thereof, conform to 6.1.10.2 to 6.1.10.6.

6.1.10.2 Holes

Holes for screws, pins etc., shall conform to EN 13611:2000, 6.2.2.

6.1.10.3 Closure parts

Closure parts shall conform to EN 13611:2000, 6.2.9 (second paragraph).

6.1.10.4 Screwed fastenings

Screwed fastenings shall conform to EN 13611:2000, 6.2.5.

6.1.10.5 Jointing

The use of jointing compounds, soldering or other processes shall be performed in accordance with EN 13611:2000, 6.2.6.

6.1.10.6 Pressure test nipples

Pressure test nipples, where fitted, shall conform to EN 13611, 6.4.7.

6.1.11 Sensed medium

The manufacturer shall declare the nature of the sensed medium for which the PSD is designed.

6.1.12 S Class PSD

The construction requirements for S class PSDs shall be as follows:

a) switching parts shall have the characteristics of a snap-acting contact as defined in EN 60730-1 and EN 61058-1;

b) PSD shall not use reed relays or reed contacts;

c) pressure-stressed measurement parts shall be manufactured from corrosion resistant materials;

d) maximum declared ambient temperature shall be ≥ 70 °C;

e) PSD shall, as a minimum, meet the requirements of EN 60529:1991, IP44.

6.2 Materials

6.2.1 General

The quality of materials and the dimensions used, the methods of assembling and the performance characteristics shall conform to EN 13611:2000, 6.3.1.

Where plastics materials are used, they shall have a declared heat deflection temperature of not less than 1,2 times the maximum declared ambient temperature when measured in accordance with EN ISO 75 and by reference to the plastics manufacturer's data.

6.2.2 Zinc alloys

Zinc alloys, where used, shall conform to EN 13611:2000, 6.3.4.

6.2.3 Housing

For combustible gas PSDs, gas-carrying compartments shall be constructed such that either:

a) on removal or fracture of non-metallic parts, not more than 70 dm^3/h of air can escape at the maximum working pressure under any circumstances when tested as follows:

— with the exception of O-rings, seals and gaskets, remove non-metallic parts of the housing which separate a gas-carrying compartment from the atmosphere:

— pressurize the ports of the PSD to the maximum working pressure.

— the leakage rate measured in accordance with EN 13611:2000, 7.3.1, except for the third and fourth paragraphs, shall not exceed 70 dm^3/h.

or

b) housings and diaphragms in PSDs for a maximum operating pressure of up to 600 mbar may be constructed from non-metallic materials provided that:

— the gas carrying compartment is protected from the gas supply by a metallically housed metallic flow restrictor of less than 1 mm diameter;

and

— a leakage rate of 70 dm^3/h is not exceeded when the PSD is returned to room temperature after the following test:

  — Store one PSD for 1 h at (135 ± 2) °C ambient temperature.

  — Apply a test pressure of three times the maximum working pressure to the pressure sensing ports of the PSD for 5 min.

  — After the PSD temperature has returned to room temperature, the leakage rate measured in accordance with EN 13611:2000, 7.3.1, except for the third and fourth paragraphs, shall not exceed 70 dm^3/h.

6.2.4 Resistance to corrosion and surface protection

Corrosion resistance and surface protection shall conform to EN 13611:2000, 6.3.6.

6.2.5 Impregnation

Impregnation shall conform to EN 13611:2000, 6.3.7.

6.2.6 Seals for glands for moving parts

Seals for glands for moving parts shall conform to EN 13611:2000, 6.3.8.

6.3 Mechanical connections

6.3.1 Threads for PSDs for combustible gas

6.3.1.1 Making connections

Connections shall be made in accordance with of EN 13611:2000, 6.4.1.

6.3.1.2 Threads

Inlet threads shall conform to EN 13611:2000, 6.4.3.

6.3.1.3 Union joints

Union joints shall conform to EN 13611:2000, 6.4.4.

6.3.2 Flanges for PSDs for combustible gas

Flanges shall conform to EN 13611:2000, 6.4.5.

6.3.3 Connections for PSDs for air and combustion products

For air and combustion products, connections shall be as declared by the manufacturer, however threads, flanges or compression fittings (if used) shall be as described in 6.3.1.

6.4 Electrical requirements

6.4.1 Except where otherwise specified in this standard, the PSD shall conform to the requirements given in the following clauses of EN 60730-2-6:1995:

a) Clauses 4, 5, 8, 9, 10, 12, 13, 14, 19, 20, 21, 23, 24, 25, 26 and 27;

b) Clause 11 (except the following which are not applicable: 11.6, 11.11.101 to 11.11.102 and 11.101 to 11.103);

c) Clause 18 (except 18.102.1 and 18.102.2 which are not applicable).

6.4.2 Electronics and software shall conform to EN 60730-1:2000, class B or ENV 14459.

6.4.3 Combustible gas or gas mixtures shall not reach electrical components, within the PSD, which arc or glow.

6.4.4 The degree of protection shall be declared in accordance with EN 60529:1991.

6.4.5 Pressure sensing devices supplied with an assembled electrical plug connector conforming to ISO 6952 or ISO 4400 shall have connections to the following pins and to earth:

— Pin (e) earth contact;

— Pin 1 NC, normally closed;

— Pin 2 NO, normally open;

— Pin 3 COM, common.

7 Performance

7.1 General

The PSD shall conform to the general performance requirements given in EN 13611:2000, 7.1.

In addition, the manufacturer's instructions shall declare all mounting positions for which any scale provided is valid, giving any appropriate correction factors.

7.2 Leak-tightness

7.2.1 Performance

The external leakage rates shall, when checked both before and after the endurance test given in 7.4.3, not exceed the following values:

— 20 cm^3/h air for PSD for use with combustible gas and

— 200 cm^3/h air for PSD for use with air/combustion products.

The test for external leakage shall be carried out with any breather holes blocked for PSDs for air and combustion products.

Closure parts shall remain leak-tight after being dismantled and reassembled.

7.2.2 Leak-tightness test

The leak-tightness test shall be performed in accordance with EN 13611:2000, 7.3.1, with the following modifications and additions:

a) the lowest test pressure for combustible gases shall be 1,5 times the maximum working pressure, but at least 220 mbar;

b) for air and combustion products, the lowest test pressure shall be 1,5 times the maximum working pressure.

The complete PSD shall additionally be tested in accordance with EN 13611:2000, 7.3.2.

7.3 Torsion

The PSD shall conform to the performance and test requirements for torsion given in EN 13611:2000, 7.4 and 7.5 with the additional requirement that, after the test, the leakage shall not exceed the values specified in 7.2.

For the purpose of the torsion test, flanged connections shall be treated as threaded connections.

7.4 Function

7.4.1 Operating pressure measurement

Test the PSD with a rising or falling pressure within 10 % of the nominal operating pressure.

For nominal operating pressures below 10 mbar, test the PSD at a ramp rate of 0,02 mbar to 0,04 mbar/s. For higher nominal operating pressures test the PSD at a ramp rate of 0,5 % of the nominal operating pressure per second.

Repeat the test three times and calculate the actual upper and lower operating pressure as the mean of the three measured values.

7.4.2 Deviation

When tested in accordance with 7.4.1, the deviation of the operating pressure shall be as follows:

— ≤ ± 15 % for PSDs for combustible gases;

— < value as declared by the manufacturer for PSDs for air and combustion products.

Adjustable PSDs shall be tested at the lowest set point.

7.4.3 Drift

After subjecting the PSD to cycles in accordance with Table 1 followed by testing in accordance with 7.4.1, the drift of the operating pressure shall be

— < ± 15 % for PSDs for combustible gas;

— < value as declared by the manufacturer for PSDs for air and combustion products.

PSDs with a fixed setting shall be tested for operating pressure before and after the endurance test. The drift shall be calculated from these two values.

Adjustable PSDs shall be tested at the lowest set point.

7.4.4 Operating differential

The operating differential after the endurance test shall be not greater than 50 % of the upper operating pressure for:

— PSDs for combustible gas in cases where the operating pressures are greater than or equal to 1 mbar;

— PSDs for air/combustion products (unless otherwise declared by the manufacturer).

7.4.5 PSDs with variable output

The manufacturer shall declare the output characteristics including the tolerances.

PSDs with variable output shall be tested the same as PSDs with automatic reset in accordance with Table 1. For test purposes, a cycle shall consist of the output varying from 10 % to 90 % and back to 10 % of the range of output of the PSD. After 50 000 cycles, however, the accuracy shall be checked to ensure that the drift does not exceed the declared tolerances. For PSD for air and combustion products, the accuracy shall also be checked after 250 000 cycles.

Table 1 — Number of cycles

Conditions	**Devices for**	
	Combustible gas	**Air, combustion products and mixtures**
Test pressure	$1{,}2 \times p_{max}$	$1{,}2 \times p_{max}$
Operating rate	As declared by the manufacturer	As declared by the manufacturer
Electrical load [a]	Maximum as declared by the manufacturer	Maximum as declared by the manufacturer
For automatic reset		
Test cycles at maximum declared ambient temperature	40 000	200 000
Test cycles at minimum declared ambient temperature	10 000	50 000
For manual reset		
Maximum ambient *T*	2 500	2 500
Minimum ambient *T*	2 500	2 500

[a] Where the electrical switch conforms to EN 61058, no electrical loading is necessary during the endurance test, provided the switch testing characteristics according to EN 61058-1 and the operating criteria of the PSD are compatible.

7.4.6 'S' class PSDs

PSDs designated class 'S' shall, in addition to the other requirements given in 7.4, meet the following additional requirements:

a) the leakage of the PSD shall remain within the limits of 7.2 when tested as follows:

— Apply a pressure of 4 times the maximum working pressure to the PSD at maximum ambient temperature for a minimum of 5 min;

— Cool the PSD to (20 ± 5) °C and perform the leak-tightness test given in 7.2.2.

NOTE This test is not applicable if 1,5 times the maximum working pressure of the PSD is greater than 4 times the maximum operating pressure.

b) the PSD shall withstand an endurance test of 2 000 000 cycles at maximum ambient temperature, at a test pressure of 1,2 × maximum pressure (p_{max}) and a cycle rate of up to 20 cycles per min;

c) the drift shall remain within the values of 7.4.3 when tested as follows:

— subject the PSD to a pressure of 1,3 times the maximum working pressure at the maximum ambient temperature for 100 cycles with a pressure ramp rate as given in 7.4.1;

— measure the operating pressure in accordance with 7.4.1.

7.4.7 Vibration

Where a manufacturer declares a PSD to be vibration resistant, it shall be tested in accordance with EN 298:2003, 6.5.2.2.2, with the PSD mounted in the least favourable position according to the manufacturer's declarations. During the vibration test, the PSD shall not be subjected to pressure or electrical loading.

Following the vibration test, the PSD shall conform to the drift requirements of 7.4.3 and the leakage requirements of 7.2.

7.5 Durability

7.5.1 Elastomers in contact with combustible gas

Elastomers in contact with combustible gas shall conform to EN 549.

7.5.2 Marking

The durability of the marking shall be in accordance with EN 13611:2000, 7.8.6 and 7.8.7.

7.5.3 Resistance to scratching

The PSD shall be scratch-resistant in accordance with EN 13611:2000, 7.8.8 and 7.8.9.

7.5.4 Resistance to humidity

The PSD shall be resistant to humidity in accordance with EN 13611:2000, 7.8.10 and 7.8.11.

8 Marking, installation and operating instructions

8.1 Marking

The following information shall be durably marked on the PSD in a clearly visible position:

a) manufacturer and/or trade mark;

b) manufacturer's type reference;

c) maximum working pressure (in mbar or bar);

d) for PSDs for combustible gas use, the word "gas" shall be marked following the maximum working pressure;

e) year of manufacture (may be given in code);

f) identification of terminals, including earth;

g) nature of electrical supply and frequency;

h) rated voltage;

i) contact rating;

j) degree of protection if greater than IP40 (see EN 60529:1991);

k) symbol of Class II construction for Class II PSDs;

l) symbol “S” for class ‘S’ PSDs.

8.2 Installation and operating instructions

One set of instructions shall be supplied with each consignment, written in the language(s) of the country into which the devices will be delivered. They shall include all relevant information on use, installation, operation and servicing, in particular:

a) electrical data;

b) ambient temperature range;

c) mounting position(s);

d) maximum working pressure;

e) gas/air connections;

f) performance data, e.g. operating pressure range (set point range), operating differential;

g) external filter specification, if applicable (see 6.1.8).

8.3 Warning notice

A warning notice shall be provided, conforming to EN 13611:2000, 9.3.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 90/396/EEC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 90/396/EEC.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in table ZA confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA – Correspondence between this European Standard and Directive 90/396/EEC

Clause(s)/sub-clause(s) of this EN	**Essential Requirements (ERs) of Directive 90/396/EEC**	**Qualifying remarks/Notes**
	1 General conditions	
Complete standard	1.1 Safety of operations	
8.2n/a8.38.2	Installation instructions User instructions Warning notices Official language of instructions	
8.2	1.2.1 Installation instructions	
n/a	1.2.2 User instructions	
8.3	1.2.3 Warning notices	
7, 8.2 8.2	1.3 Correct operation Instructions	
	2 Materials	
6.2	2.1, 2.2 Suitability for safety and intended purpose	
	3 Design and construction	
	3.1 General	
6.1	3.1.1 Safety of construction	
n/a	3.1.2 Water/air penetration in gas circuit	
6.1, 6.2	3.1.3 Risk of explosion in the event of external fire	
n/a	3.1.4 Water penetration	
7.1	3.1.5 Normal fluctuation of auxiliary energy	

n/a	3.1.6 Abnormal fluctuation of auxiliary energy	
6.4	3.1.7 Hazards of electrical origin	
n/a	3.1.8 Pressurized parts	
n/a	3.1.9 Failure of safety, controlling and regulating devices	
n/a	3.1.10 Overruling safety devices	
6.1.6, 6.2.6	3.1.11 Protection of parts set by the manufacturer	
n/a	3.1.12 Controlling and setting devices	
	3.2 Unburned gas release	
7.2	3.2.1 Gas leakage	
n/a	3.2.2, 3.2.3 Gas accumulation	
n/a	3.3 Ignition	
n/a	3.4 Combustion	
n/a	3.5 Rational use of energy	
n/a	3.6 Temperatures	
n/a	3.7 Foodstuffs and water used for sanitary purposes	
n/a	Annex II Certification procedures	
n/a	Annex III CE conformity mark and inscriptions 1. Mark	
8.1	2. Data plate	

WARNING: Other requirements and other EU Directives may be applicable to the products falling within the scope of this standard.

SABS – Standards Division

The objective of the SABS Standards Division is to develop, promote and maintain South African National Standards. This objective is incorporated in the Standards Act, 2008 (Act No. 8 of 2008).

Amendments and Revisions

South African National Standards are updated by amendment or revision. Users of South African National Standards should ensure that they possess the latest amendments or editions.

The SABS continuously strives to improve the quality of its products and services and would therefore be grateful if anyone finding an inaccuracy or ambiguity while using this standard would inform the secretary of the technical committee responsible, the identity of which can be found in the foreword.

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